

REMARKS

In the Office Action: claim 3 was allowed; claim 16 was rejected under 35 USC § 112, second paragraph on various grounds; claim 16 was rejected under 35 USC § 102(b) over JP 02-187734A (“Sekisui”); claims 16-18 were rejected under 35 USC § 102(b) over J. Phys. Chem. 1993, 97, pp. 9385-9389 (“Puccetti”); and claims 16-18 were rejected under 35 USC § 102(e) or 35 USC § 103(a) over USPN 5,912,257 (“Prasad”).

In response to the Office Action, claims 16-18 have been amended without prejudice. Support for the amendments may be found throughout the application as filed, for example in the original claims. No new matter is added.

Summary of Telephonic Interview

A telephonic interview was conducted on or about February 8, 2007. The cited art was discussed. Applicants pointed out that two of the cited references (Prasad and Sekisui) contain compounds that do not fall within the scope of Applicants claims, and thus cannot anticipate or render obvious the claims as those references do not meet all the claim elements. Applicants also pointed out that at least two of the references (Puccetti and Sekisui) discuss the transparency (i.e., lack of absorption) of their materials at the relevant wavelengths, and thus would not be expected to exhibit any absorption, much less the more demanding two or multi- photon absorption as claimed. Applicants further discussed the fundamental differences between two photon absorption, as claimed, and second harmonic generation, which is a non-absorptive process. Applicants pointed out that these two phenomenon impose different requirements on the symmetry of molecules exhibiting these properties, and that materials exhibiting second harmonic generation would therefore not inherently exhibit two-photon absorption. Applicants

also pointed out that the desired uses of materials for second harmonic generation, such as frequency upconversion, would be negatively impacted if those materials absorbed the very wavelengths they were designed to produce, and would be contrary to their principle of operation. Applicants offered to provide references discussing the transparency characteristic of materials used for second harmonic generation.

The Rejections Under 35 USC § 112, Second Paragraph

Claim 16-18 were rejected under 35 USC § 112, second paragraphs, on the grounds that certain terms allegedly rendered the claims indefinite. These rejections are traversed.

Definiteness and Distinct Claiming Under 35 USC § 112, Second Paragraph

"The requirement to 'distinctly' claim means that the claim must have a meaning discernible to one of ordinary skill in the art when construed according to correct principles. Only when a claim remains insolubly ambiguous without a discernible meaning after all reasonable attempts at construction must a court declare it indefinite." *Metabolite Labs., Inc. v. Lab. Corp. of Am. Holdings*, 370 F.3d 1354, 1366, 71 USPQ2d 1081, 1089 (Fed. Cir. 2004).

As set forth in MPEP 2173.02, a claim term is definite if its meaning is discernible. *Bancorp Services, L.L.C. v. Hartford Life Ins. Co.*, 359 F.3d 1367, 1372, 69 USPQ2d 1996, 1999-2000 (Fed. Cir. 2004).

Only if a claim term is insolubly ambiguous after all reasonable efforts at construction can it be declared indefinite.

Amino Acid. The term amino acid was said to be unclear in the definitions of Re-m, R_{a1-a3}, R_{b1-b3} and R_{g1-g3} as used to form a functional group. It is respectfully submitted that one of skill in the art understands what an amino acid is, and is capable of forming a derivative of the compounds within the claims from an amino acid. This term is not insolubly ambiguous. Furthermore, working examples of compound derivatives of amino acids as claimed are provided, and the prior arguments in this regard are hereby incorporated. No evidentiary support

has been provided for this rejection. Such support for this rejection is requested, in the form of a declaration or other scientific evidence, so that Applicants may rebut any admissible evidence. Because the meaning of the term

Definitions of m, n and o and the pi bridge. Claims 16-18 were rejected as allegedly lacking written description and as allegedly indefinite for the case where m and o were zero, indicating the location of the pi bridge was unclear in this case. These rejections are traversed.

Applicants have revised the claims towards their original form, where each of m, n and o can be from 0-10. The pi bridge in such cases is present in the terminal cyclic groups to which the donor groups are attached; the linked rings exhibit alternating pi bonds throughout their structure. This is clear from the formulas recited in the claims.

As the meaning of the claim terms can be discerned by one of skill in the art, these terms are definite. Withdrawal of these rejections is respectfully requested.

The Cited Art Rejections

Claim 16 was rejected under 35 USC §102(b) over JP 02-187734A (“Sekisui”); claims 16-18 were rejected under 35 USC §102(b) over Puccetti (J. Phys. Chem. 1993, 97, pp. 9385-9389); and claims 16-18 were rejected under 35 USC §102(e) or 35 USC §103(a) over USPN 5,912,257 (“Prasad”). These rejections are traversed. The art cited in the Office Action does not teach or suggest the invention as claimed. Applicants’ prior arguments regarding the lack of foundation of inherent anticipation and obviousness are hereby incorporated by reference. Additional arguments are presented below.

The cited art does not teach or suggest exciting compounds within the claims via two photon absorption.

Prasad and Sekisui do not discuss compounds falling within the claim scope. As discussed in the interview, Prasad's cited compound has an electron accepting group at the position requiring an electron donating group in the claimed methods. See Prasad's definition of W at col. 17 lines 21-34. Prasad is discussing donor-pi-acceptor molecules (D- Π -A), rather than the D- Π -D (donor-pi-donor) compounds used in the claims. See also column 10 lines 45-59. The claim methods require a donating group at the para position in those embodiments where six membered terminal rings are present, where Da and Db are N, O, S or P and have specific substituents not found in Prasad's W group.

Thus Prasad lacks the claim element of an electron donating group at a position required by the claims. Prasad therefore cannot support an anticipation or obviousness rejection, as it completely lacks this claim element.

Similarly, Sekisui teaches a meta-substituted central aromatic ring, whereas the claims require a para- substituted ring where the ring is six membered (see claim 16 above). Thus Sekisui lacks a compound having a pi bridge as claimed, and lacking this claim element, cannot support an anticipation or obviousness rejection.

As Prasad and Sekisui do not teach or suggest the claim elements of the compound structures used in the claimed methods, they cannot support anticipation or obviousness rejections. Withdrawal of rejections based on Prasad and Sekisui is requested on these grounds.

The cited art does not teach or suggest two photon absorption. As has been acknowledged, neither Prasad, nor Sekisui, nor Puccetti discuss multiphoton absorption. The pending rejections are based in part on assertions that second harmonic generation as discussed in the cited art would inherently lead to two photon absorption. This is not correct. During the interview, extensive discussion took place regarding the fact that second harmonic generation is a non-absorptive process. No photons are absorbed in this phenomenon itself, much less two or more simultaneous absorptions as required by the claims. Thus, second harmonic generation does not inherently result in two-photon absorption.

Puccetti and Sekisui teach away from absorption of energy by their materials. As discussed during the interview, Puccetti teaches that his compounds are *transparent* at the wavelengths employed. See page 9388, right column (the harmonic wavelength ... is located within the transparency range of the molecules). Thus the molecules used by Puccetti do not absorb at $\frac{1}{2}$ or $\frac{1}{3}$ the wavelength of the incident light; Puccetti chose wavelengths to specifically avoid any absorption.

It was also noted during the interview that, although Sekisui's compound does not fall within the claim scope (see above), Sekisui also teaches that the material exhibits high or superior transparency. See the translation and the abstract (exhibit A).

The cited art thus teaches away from any absorption by a material of energy produced from it via second harmonic generation.

Materials exhibiting second harmonic generation are designed to be transparent and avoid absorption of the frequencies produced. It was discussed during the interview that it was not desirable at the time of the invention to produce materials exhibiting second harmonic

generation that also absorbed the energy produced. Second harmonic generation is used to produce a different wavelength of light than the input wavelength. Absorption of the new wavelength by the material would lead to energy loss and an inefficient process.

The cited art discusses the need for transparency, as described above. Applicants hereby provide additional evidence in the accompanying SB08 and attached references of the meaning of the term transparency in the field of second harmonic generation and the measures those of skill took to avoid absorption by the materials of energy produced by second harmonic generation. As can be seen, those of skill seek materials for second harmonic generation (SHG) that do not absorb the incident light or the second harmonic, i.e., materials that are transparent.

Nemoto et al. (Chem. Mater. 1996, 8, 1527-1534) describe polyamides exhibiting second order nonlinear optics (SHG) with “optical transparency ... down to 400 nm” (abstract). They state that “a short cutoff wavelength of second-order NLO materials is desired for practical applications, because intolerable damage would be brought to the material by the absorption of second harmonic wave generated by the near-infrared wave of diode lasers” (p. 1528, left column, second full paragraph, emphasis added). Nemoto states that they obtained material having “high and stable second-order NLO activity ... with the desired transparency” (p. 1534, last sentence, emphasis added).

Zelichenok et al. (J. Phys. Chem. B 1999, 103, 8702-8705) is in accord. They describe quinolinium crystals exhibiting nonlinear optics. They note that “one of the serious problems connected with frequency doubling for organic materials is their transparency at the second harmonic wavelength of about 415 nm for the fundamental wavelength, 830 nm, diode laser.

This problem may be overcome by creation of material with cutoff transparency at about 400 nm.” Page 8702, right column, emphasis added.

Kang et al. (J. Am Chem. Soc. 2006, 128, 6194-6205) similarly follows these known design parameters for SHG generation in describing the production of materials that are “completely transparent at the fundamental laser wavelength and at the 532 nm SHG output wavelength (2ω) (Figure 6).” Page 6204, right column, first full paragraph, emphasis added.

Burland et al. (J. Appl. Phys. 71 (1), 1 January 1992, 410-417) also discusses the need for minimizing absorption at the second harmonic at page 416, left column, first full paragraph.

Thus it was known in the art to avoid absorption of the harmonic wavelength by a material exhibiting second harmonic generation (SHG). Puccetti, the sole cited art describing compounds within the claimed methods, teaches that his materials are transparent, and his methods were thus chosen to avoid absorption of energy by the materials at the second harmonic wavelength. Puccetti’s materials thus were not inherently simultaneously absorbing multiple photons to form an excited state.

Multiphoton absorption requires a high incident flux and efficient absorption of energy so that simultaneous photon absorption can occur during the brief lifetime of a partially excited species. This cannot be achieved by materials designed to avoid absorption, as taught for materials used for SHG.

The cited references thus do not teach or suggest, either expressly or inherently, multiphoton absorption methods utilizing the claimed compounds. Puccetti and Sekisui state that their materials are transparent, with Puccetti expressly stating that the material was


transparent at the second harmonic. The references provided herewith demonstrate that those of skill sought transparency in materials generating second harmonic wavelengths, meaning lack of absorption by the material of the harmonic produced.

It is respectfully asserted that the cited art cannot support obviousness or anticipation references based on an inherency theory. Withdrawal of the art-based rejections is respectfully requested.

CONCLUSION

As the claims are believed in order for allowance, a notice to that effect is respectfully requested. Should the Examiner disagree, a telephonic interview is conditionally requested prior to the issuance of a subsequent Office Action so that any remaining issues can be discussed. The undersigned may be reached at (858) 228-7829.

Respectfully submitted,

A handwritten signature in black ink, appearing to read "David W. Maher", is written over a horizontal line.

David W. Maher
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